

Ocean Water Desalination Program

Concept Development Paper

*Orange County Water District
and
Municipal Water District of Orange County*



October 2003



DRAFT

OCEAN WATER DESALINATION PROGRAM

CONCEPT DEVELOPMENT PAPER

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OCEAN WATER DESALINATION PROGRAM

CONCEPT DEVELOPMENT PAPER

The attached *Ocean Water Desalination Program (OWDP) Concept Paper* has been prepared to provide the Orange County Water District (OCWD) and Municipal Water District of Orange County (MWDOC) Boards with additional information on potentially developing an ocean water desalter at the AES site in Huntington Beach.

The purpose of this *Concept Paper* is to outline the AES site opportunities and identify the key issues that would need to be resolved for the District to move forward with beginning detailed planning and implementation efforts. The *Concept Paper* is intended to provide sufficient preliminary information so that the Board can determine if the District should further pursue ocean water desalination at the AES site.

The project concept developed in this Concept Paper envisions development of a 50 million gallons per day (mgd) ocean water desalination plant (OWDP) at the AES power plant in Huntington Beach to provide base water supply for the OCWD service area. A 50 mgd plant could be expected to produce 50,000 afy. The conceptual approach defining entity roles and responsibilities assumes: (1) project development and management by OCWD/MWDOC; (2) project design, construction, and financing through a public/private partnership; (3) plant operations by OCWD; (4) product water sales by MWDOC; and (5) operating the OWDP in conjunction with the OCWD Coastal Pumping Transfer Program (CPTP) or alternatively a coastal in-lieu program.

Water elevations within the basin would be modified by underpumping along the coast. The hypothesis is because water elevations along the coast would rise, less seawater barrier injection water would be required. Under the CPTP program BEA payments collected from the forebay producers would be used to offset the cost of the OWDP. Figure 1 illustrates the project concept.

The reduced pumping would raise coastal groundwater basin water levels and would act to deter seawater intrusion. In addition, if the OWDP is quickly constructed and was utilized in conjunction with an in-lieu program, the groundwater basin's overdraft could be reduced. However, these same benefits could be achieved using Metropolitan's supplies.

The net unit cost of the OWDP could be as low as \$84/af assuming the following:

- Utilizing a reported year 2010 unit cost of \$650/af for treatment from private interests;
- Using a three percent factor over seven years to obtain a \$529/af unit cost for the year 2003 to allow for comparisons with current day water supplies;
- Increasing the cost by \$80/af to fully integrate the plant with the surrounding distribution systems;
- Receiving a full 50 mgd Metropolitan subsidy of \$250/af;
- Allocating revenues from other OCWD programs such as the in-lieu (\$199/af) or the CPTP (\$275/af) to lower the OWDP unit cost. However, this would create an impact to the District's replenishment assessment.

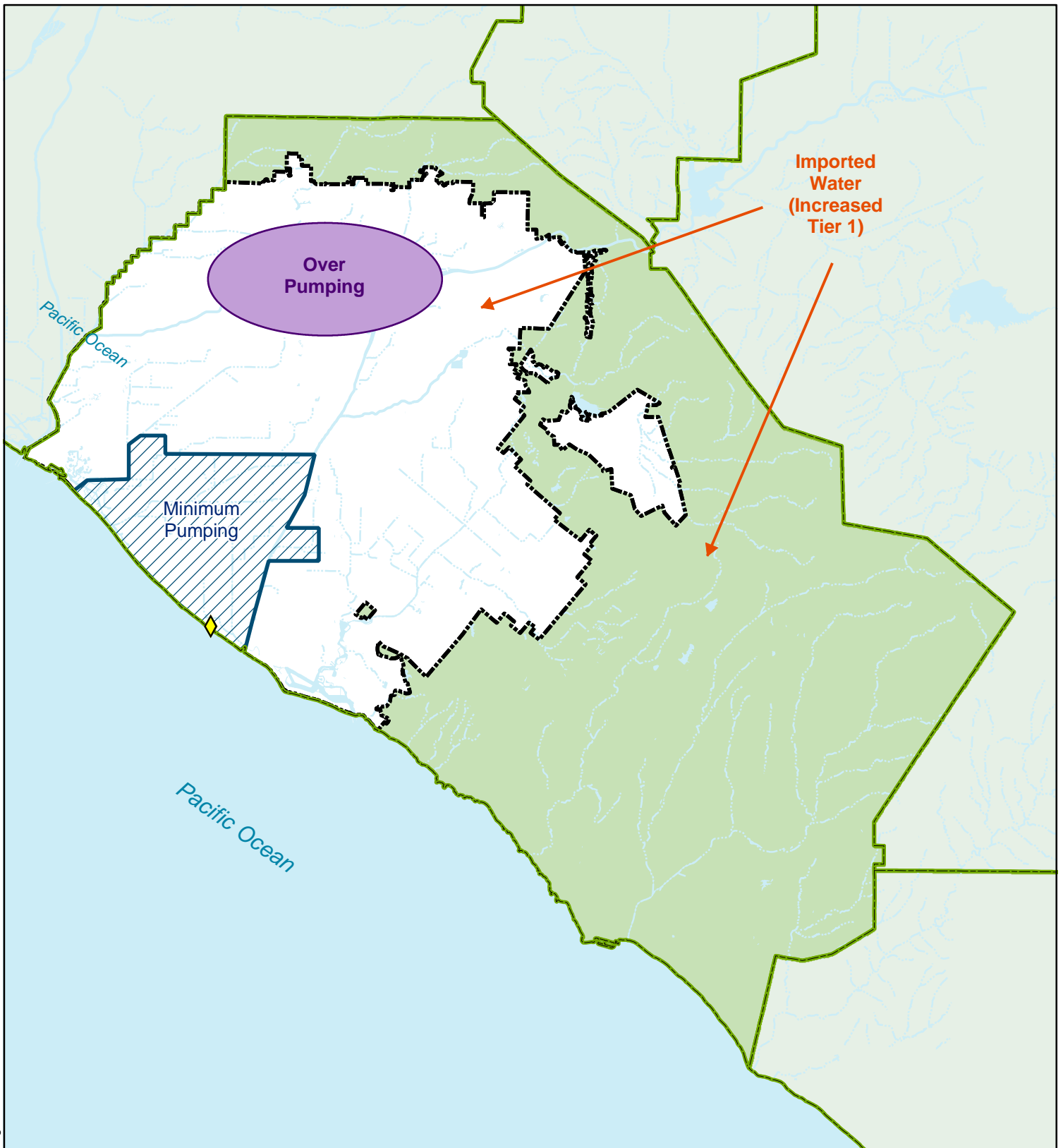




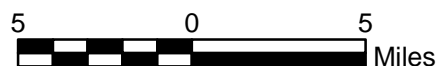
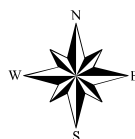


Figure 1. Operational Approach -- Average Year

Underpumping would occur along the coastal portion of the groundwater basin, with the OWDP as a new coastal supply. Overpumping in the forebay would occur and the BEA revenue would be collected.

-  Ocean Water Desalination Plant (OWDP)
-  OWDP Service Area
-  OCWD Boundary
-  MWDOC Boundary



I. SUMMARY OF FINDINGS

- OCWD water demands in 2025 will exceed the current supplies by 109,000 acre-feet per year (afy), and an OWDP could help meet this need.
- Constructing the OWDP would significantly improve the area's water reliability and could improve the management of the groundwater basin.
- Several OWDP alternatives could be implemented; the option examined in this *Concept Paper* considers a base water supply for the OCWD water service area.
- Groundwater wells along coastal OCWD could be turned off as part of a large in-lieu program with the OWDP providing the alternative source water. However, this same type of basin management program could be accomplished using Metropolitan water, if available.
- The assumed project delivery approach outlined in the Paper consists of a public/private partnership and the reported cost remains unverified.
- Implementation of the OWDP would require regulatory compliance, environmental stewardship and stakeholder interface, and a 5-10 year completion schedule.
- Several key issues need to be addressed for implementation of the OWDP, including identification of water system integration requirements and customer needs.
- Conceptual total system unit costs are in the range of \$609-1130 per acre-feet (af), or \$359-880/af if Metropolitan Water District of Southern California (Metropolitan) rebates are obtained.
- Several steps would need to be undertaken by OCWD and/or MWDOC to implement the OWDP:
 - Resolve regulatory and permitting issues
 - Secure Metropolitan funding (and adjustment of current application from 28,000 afy to 50,000 afy)
 - Formulate the details of an MWDOC / OCWD partnership
 - Formulate a partnership with the OCWD cities and water districts
 - Formulate a partnership with a private company
- Suggested planning activities to be conducted by OCWD / MWDOC are listed below:
 - Estimate costs for implementation planning and development work
 - Evaluate staff and consultant options to conduct the work
 - Conduct a risk assessment on the implementation issues
 - Refine the system integration costs
 - Refine the financing cost estimates & OCWD / MWDOC cost/supply allocation
 - Initiate partnership discussions with MWDOC, OCWD producers, and Huntington Beach (system integration; city benefits, Capital Improvement Program savings, and other issues)
 - Conduct groundwater modeling to quantify basin operational benefits

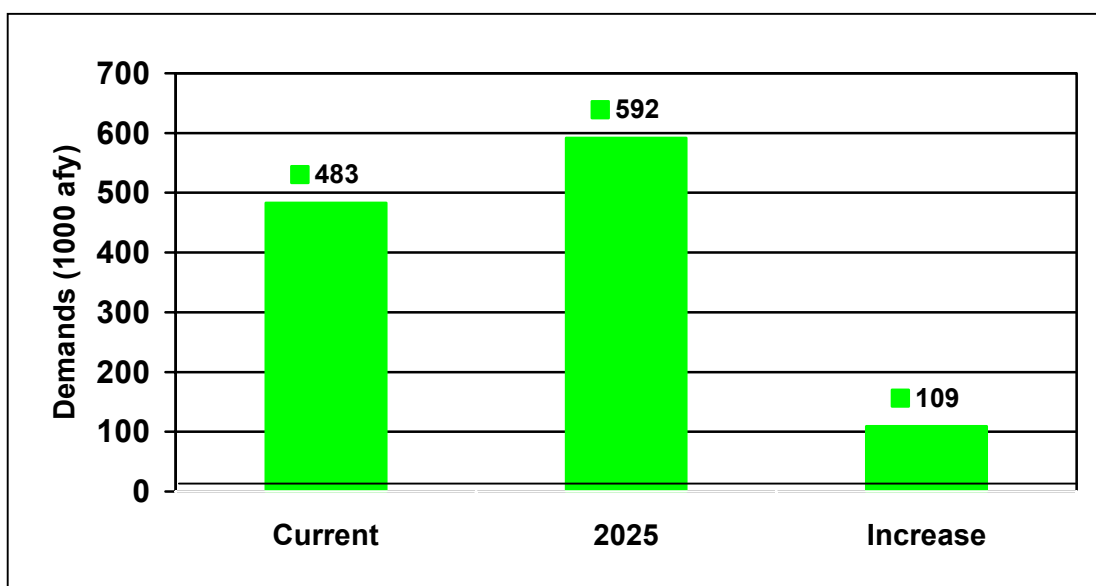
- Add staff resources for projected workload
- The approach outlined in this *Concept Paper* is a “fast track” option. A more conventional planning process would be to identify the exact role of the OWDP in future water supply portfolios in the upcoming studies: OCWD’s *Long-Term Facilities Plan* and MWDOC’s *South Orange County Water Reliability Study – Phase 2*.

II. BACKGROUND

WATER DEMANDS

Current and future demands for water in OCWD are shown on Figure 2. Over the next 20 years, water demands are expected to increase by 109,000 afy. These estimates are based on recent MWDOC studies on projected water demands (OC-MAIN Program), which show lower projected demands than earlier projections done in 1999-2002. MWDOC estimates the projected demands are lower due to projected aggressive conservation measures and the implementation of Metropolitan's Tier II rate structure.

Figure 2 –Orange County Water District Demands



CURRENT WATER SUPPLIES

OCWD is fortunate to have a diversified supply mix. Sources of current water supplies are described in Table 1, and include imported water (direct and replenishment), groundwater, recycled water, and GWR System – Phase 1. Together these sources meet current demands. As documented in Figure 1 above and in Table 1 below, Orange County does not have sufficient supplies to meet future projected demands. Certainly one option to meet future demands is to rely on Metropolitan. There are, however, a number of different opportunities for supply development that Orange County could reasonably undertake.

Table 1
Current Orange County Water District Supplies

Source	Supply (afy)
Imported Water	180,000 ^(a)
Groundwater	265,000 ^(b)
Recycled Water	15,000 ^(c)
GWR System – Phase 1 (2007)	<u>72,000</u>
Total	532,000

(a) Includes direct deliveries, typical replenishment water amounts (60,000 afy), and conservation

(b) Includes SAR recharge, injection at Talbert and Alamitos barriers, and incidental recharge; excludes basin refill supply

(c) Includes OCWD GAP and IRWD sources

FUTURE WATER SUPPLIES

Various potential sources of future OCWD water supplies include:

- Expanded conservation
- Expanded traditional water recycling (irrigation and other uses)
- Expanded groundwater recovery (brackish water demineralization)
- Future phases of GWR System
- Seawater desalination
- Additional imported water (at Tier II rates)
- Transfers and dry year options

This paper focuses on the opportunity to develop desalinated water in the City of Huntington Beach and the unique opportunity and challenges in developing an OWDP at this location.

III. POLICY PRINCIPLES

The following policy principles will guide the development of an OWDP.

- Develop the project concept through a joint OCWD / MWDOC partnership
- Evaluate facilities development at the Huntington Beach AES Power Plant site to take advantage of the opportunities and available at this location
- Pursue project delivery by a competitive approach among qualified companies; potentially through a public / private partnership or other cost effective approaches
- Develop a collaborative regulatory compliance process and stakeholder interface
- Provide for environmental stewardship and public outreach

OCWD / MWDOC PARTNERSHIP

MWDOC has the responsibility for providing regional water supplies to Orange County. OCWD brings to the table long-term experience in membrane processes and the development and operation of major supply and treatment facilities, together with fulfillment of its groundwater basin management mission. The focus and skills of the two agencies could forge an effective partnership for development of an OWDP. The successful OCWD/Orange County Sanitation District (OCSD) partnership for joint management/staffing/funding of the GWR System to meet the goals of both agencies can be used as a model for OWDP implementation.

A conceptual approach defining the roles and responsibilities among the several affected entities involved in the OWDP is outlined below:

<u>Activity</u>	<u>Entity</u>
Project development and management	OCWD / MWDOC or Anaheim/Santa Ana
Project design and construction	Qualified private company (to be determined)
Project financing	Qualified private company (to be determined)
Plant operations	OCWD
Product water sales	MWDOC or OCWD
Revenue sources	OCWD
CEQA lead agency / responsible agency	OCWD

FACILITY SITING

This *Concept Development Paper* is focused on development of the OWDP at the site of the Huntington Beach Power Plant (See Figure 3). This site is the basis of current planning efforts by Poseidon Resources Corporation (PRC), and is the logical site for an OWDP to meet OCWD coastal supply needs. Program economics

would be improved by avoiding costs for new ocean intake and outfall pipelines. Construction at an existing site would minimize local environmental impacts. MWDOC is also investigating the feasibility of developing an OWDP at one of two sites in South Orange County (SOC) (Dana Point and the San Onofre Nuclear Generating Station) but these sites are not being evaluated in this *Concept Paper*.

Figure 3
Facility Site



PROJECT DELIVERY APPROACH

Several different project delivery approaches are available for implementation of an OWDP, ranging from a conventional design/bid/build/operate approach by public agencies like OCWD and MWDOC, to a water purchase contract with a single private entity. The approach that is assumed for this *Concept Paper* consists of the following elements:

1. Management and oversight by OCWD and MWDOC
2. Development by a private consortium (e.g., Engineer/Procure/Construct [EPC])
3. Plant operations by OCWD
4. Product water sales by MWDOC
5. Competitive selection among pre-qualified private companies for EPC services

REGULATORY COMPLIANCE

There are a considerable number of regulatory and permitting requirements for an OWDP. A preliminary listing of potential agency approvals and/or permits that may be required for such a project is listed below:

Federal

- Army Corps of Engineers (ACOE)
- U.S. Fish and Wildlife Service (USFWS)
- NOAA – National Marine Fisheries Service (NMFS)
- National Environmental Protection Act (NEPA) Compliance

State

- California Coastal Commission (CCC)
- Department of Health Services (DHS)
- Regional Water Quality Control Board (RWQCB)
- State Lands Commission (SLC)
- California Department of Fish and Game (DFG)
- California Department of Transportation (CalTrans)
- California Environmental Quality Act (CEQA) Compliance

Local, County and City

- Discretionary Land Use / Zoning Permits
- Coastal Development Permit
- Easements and Encroachment Permits

A collaborative approach will be necessary to effectively complete the regulatory and permitting process, particularly with agencies such as the California Coastal Commission (CCC) and California Department of Health Services (DHS). Significant work in these areas has been completed by PRC. Previous collaboration efforts with the CCC regarding permitting of salt reject discharges from other brackish water and ocean water desalination projects can be followed as models, together with recent efforts at developing permit conditions by DHS on the GWR System.

The CCC has recently issued a draft report on *Seawater Desalination and the California Coastal Act*, which lists several issues of concern, including: protection of ocean water as a public resource (public trust doctrine); potential effects of international trade agreements (foreign corporations); growth inducement; private ownership of water services, biota impingement in ocean water intakes, brine disposal, and others. The Executive Summary of the report is included in Appendix B.

ENVIRONMENTAL STEWARDSHIP AND STAKEHOLDER INTERFACE

As with any significant public works project, effective interface with stakeholders is critical to project success. Regarding environmental stewardship, several environmental impact areas have surfaced during the ongoing review of the Draft Environmental Impact Report (DEIR) for a PRC OWDP at the AES power plant in

Huntington Beach. These include potential impacts in six areas that can be mitigated to less than significant levels, and one area that cannot be mitigated to less than significant levels (Short-term Construction – Related Emissions). Critical environmental issues include: seismic stability of structures, sensitive biological resources in adjacent areas, ocean impacts of brine disposal, growth inducement (including cumulative impacts of other OWDPs), coastal development permit conditions, other local Sierra Club concerns, interface with the future of the AES power plant, limited benefits to Huntington Beach, and Huntington Beach concerns about private company operations.

IV. PROGRAM OBJECTIVES

If there was a 50 mgd ocean water desalination supply in Huntington Beach, it could be utilized in a number of different ways including:

1. As a base water supply for all Orange County
2. As a base water supply for OCWD only
3. As a base water supply for SOC only
4. As an emergency water supply for SOC
5. Combination of Options 2 and 4 as part of an overall basin management strategy

The scope of this analysis is narrowly focused on option number 2 – a base supply for OCWD. Specifically the OWDP supply would be developed to provide a 50 mgd OWDP base water supply for OCWD.

Several water management objectives for the OWDP have been developed, and are summarized as follows:

- Provide a new base supply to coastal OCWD
- Reduce coastal OCWD groundwater pumping, either through in-lieu techniques, or by using the CPTP to minimize the risk of seawater intrusion
- Improve Orange County's water supply reliability
- Improve the management of the Orange County groundwater basin

NEW BASE SUPPLY FOR OCWD

As documented earlier, OCWD will need an additional 109,000 afy of water by the year 2025 to meet the increased demands. Therefore, there is a need to develop one or more new base supplies to supplement current supplies. The new supply would have the benefit of providing another source for the supply portfolio necessary to maintain optimum basin levels, particularly through drought periods. The OWDP could be one of the alternative supplies to meet these needs, if it could be developed economically and effectively. However, OCWD cannot count on the OWDP being developed in time to help with the current basin refill strategy. The question then is what is the best role for OWDP with respect to long-term basin operations?

GROUNDWATER PUMPING REDUCTION

This OWDP implementation scenario would significantly reduce groundwater pumping levels in coastal OCWD and assist in refilling the groundwater basin. This could also be accomplished by purchasing additional amounts of either in-lieu or full-service imported water. This *Concept Paper* considers an "in-lieu" scenario in which annual pumping is reduced by about 95 percent in Huntington Beach, the City of Newport Beach (NB), Mesa Consolidated Water District (MCWD), and the City of Fountain Valley (FV). Such a program would be beneficial to groundwater basin conditions. An immediate rebound of water levels and improved seawater intrusion control would be realized. Under winter conditions when demands are lower, additional producers could also participate in the Program (e.g. City of Seal Beach, City of Westminster, City of Garden Grove, and Irvine Ranch Water District [IRWD]).

These entities could be provided with potable water from the OWDP “in-lieu” of typical groundwater extractions, at the same in-lieu rates and similar to previous “in-lieu” programs utilizing imported water from Metropolitan and MWDOC.

A hypothetical allocation of a 50 mgd OWDP supply serving the four principal coastal producers, together with a minimum level of continued groundwater pumping to maintain viable wellfield operation and control well biofouling is shown in Appendix A (Table A-1). The summer data closely matches groundwater pumping projections recently provided to MWDOC by the producers, assuming the current Basin Production Percentage (BPP) of 66 percent.

It is not known if the coastal groundwater producers would and/or could turn off their wells for most of the year and receive OWDP water to the extent described. Water not used for this purpose could be made available to other producers. The cost of this in-lieu operation using OWDP supplies could be expensive to the District. Under an in-lieu program the producer pays the District the RA (\$149/af) and what would have been their energy cost (typically \$50/af). These revenues to the District would help offset the cost of the OWDP water supply. The difference of the source water cost and \$199/af (\$149/af + \$50/af) is paid by the District. Currently the District initiates in-lieu programs with Metropolitan water costing \$290/af.

The OWDP could significantly reduce coastal groundwater production, potentially assist in refilling the groundwater basin and correspondingly raise groundwater levels along the coast. The GWR System is being constructed to provide for the injection of approximately 36,000 afy of water along the coast to prevent seawater intrusion. District staff has estimated up to 45,000 afy of injection along the Talbert gap may be necessary in the future to accommodate increased pumping from the groundwater basin, not including potential injection that may be needed in the future in the Bolsa and Sunset Gaps. However it is remotely possible that the OWDP, and the correspondingly higher groundwater levels it would create, could make it difficult to inject water into the groundwater basin during the winter months when groundwater levels are seasonally higher. Such a scenario would be good from a basin management standpoint, as the threat of seawater intrusion would be eliminated. More GWR System water would then be pumped up to the forebay spreading facilities.

A more likely outcome is that the capital improvements that are necessary to allow for the injection of up to 45,000 afy of water into the barrier in the future could be reduced. In addition, as existing injection wells deteriorate and become unserviceable they may not need to be replaced because of the OWDP. These avoided capital expenses have not been estimated but would be in the tens of millions of dollars.

Staff recently provided a presentation indicating that seawater intrusion is becoming a concern in the Bolsa and Sunset Gaps. The OWDP could potentially provide the necessary source water for a seawater barrier facility located in this area, if necessary.

Groundwater basin modeling of these possible scenarios could be undertaken to determine their likelihood. The potential future capital infrastructure savings could also be estimated.

COASTAL PUMPING TRANSFER PROGRAM

The OWDP could also be used in conjunction with the CPTP as shown in Figure 2. The District, along with administrative support from the MWDOC significantly expanded the CPTP in fiscal year 2003-04 to result in overpumping in the forebay and reduce groundwater basin tilt. The CPTP is fundamentally different from the in-lieu program as no water is stored in the groundwater basin and the program is basically financially neutral to all involved. Groundwater production along the coast will be decreased up to 20,000 af (by four coastal producers) to increase groundwater levels along the coast and reduce the migration of ocean water into the basin. Correspondingly the groundwater production for inland producers will be increased by 20,000 af (by seven participating inland producers). The four coastal producers will receive a total of approximately \$5.5 million or \$275/af (\$5.5 million divided by 20,000 af) in Basin Equity Assessment (BEA) payments from the District as payment for pumping below the current 66 percent BPP. The seven inland agencies will pay the District the BEA for pumping above the 66 percent BPP.

The idea of using the \$275/af BEA payment from the inland producers to lower the unit cost of the OWDP has been expressed. If the CPTP could be expanded up to 50,000 afy the \$275/af payment from the inland producers could be designated to assist in lowering the unit cost of the OWDP on an acre-foot per acre-foot basis. For example, if the unit cost of the OWDP was \$359/af after receiving the Metropolitan rebate, it could be further lowered to \$84/af. These economic factors are shown graphically in Appendix D.

However designating the CPTP revenue for this purpose would not leave the District any funding to pay the four coastal agencies for pumping below the BPP. The District would be required to raise the RA to generate \$5.5 million for this purpose to cover net BEA costs to OCWD.

EMERGENCY SUPPLY FOR SOUTH COUNTY

The need for an emergency backup supply for South Orange County has been extensively studied and was fully documented in the MWDOC's *South Orange County Water Reliability Study*. If the Metropolitan Diemer WTP sustained significant damages, such as from a large earthquake, SOC could experience long outages (1-2 months). A secondary goal of the OWDP could be to provide an emergency supply to partially mitigate the system vulnerability in SOC. Under this scenario, the OCWD producers would return to previous higher groundwater pumping levels until the SOC emergency had passed, as shown in Figure 4. A 50 mgd ocean desalination facility could provide up to 78 cfs of emergency supplies. If Metropolitan water is available, the basin agencies could allow additional imported water to flow to SOC.

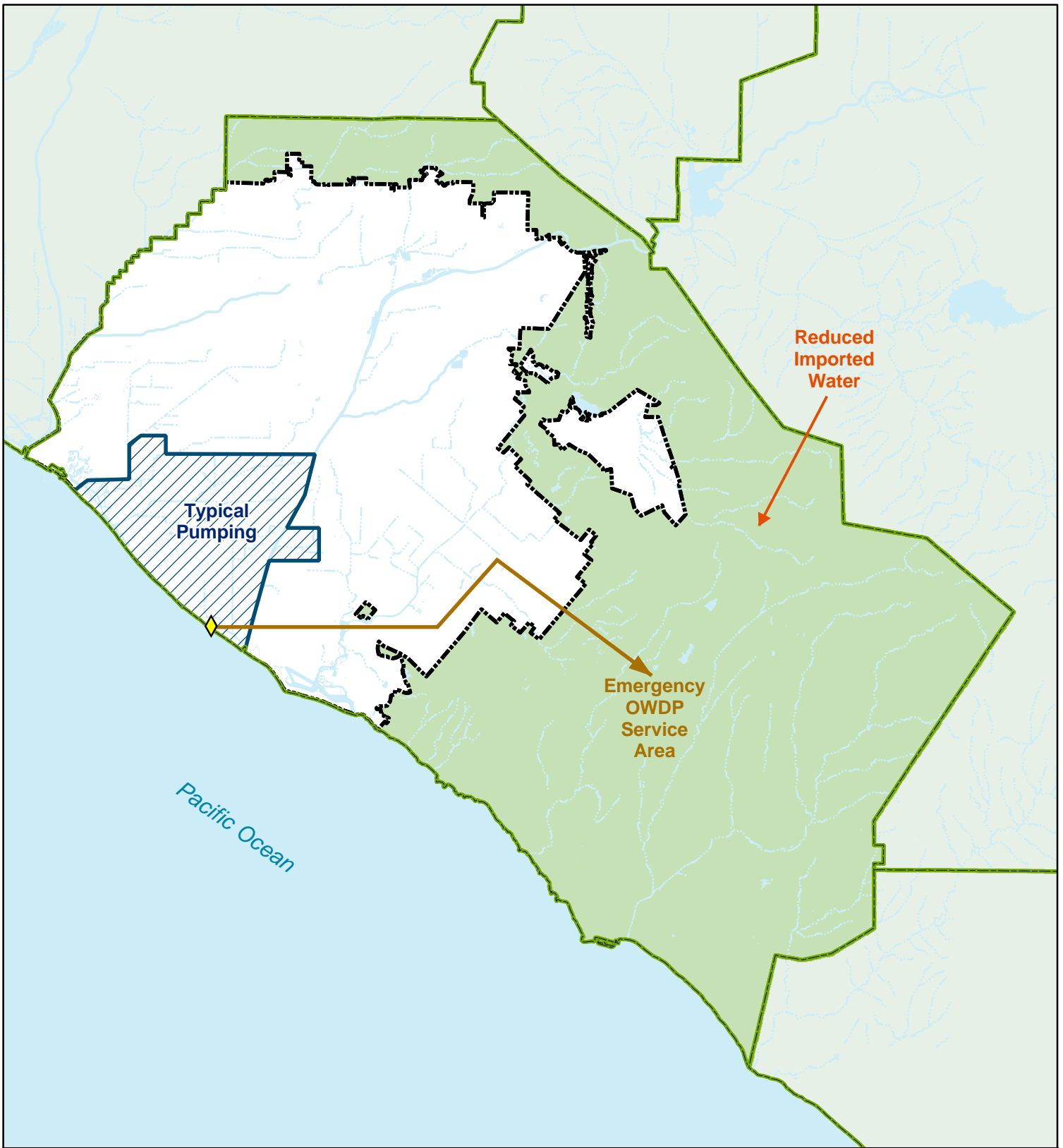







Figure 4. Operational Approach -- Emergency Response

OWDP supply would be conveyed to SOC. Imported water deliveries to SOC would be temporarily curtailed. A major portion of the SOC emergency needs would be met.

-  Ocean Water Desalination Plant (OWDP)
-  Emergency OWDP Pipeline
-  OWDP Service Area
-  OCWD Boundary
-  MWDOC Boundary



5 0 5 Miles

V. KEY ISSUES

Several key issues need to be addressed for implementation of the OWDP, which include:

- Refine water system integration requirements (between source and customer) to include agency transmission and distribution facilities
- Define individual customer needs and issues (technical, financial, institutional, environmental, and functional)
- Obtain consensus from the groundwater producers regarding modified pumping operations
- Develop reconnaissance unit water costs (\$/af) for treatment and integration facilities, based on ongoing projects and programs
- Develop a strategy to minimize the unit rate of electricity provided to operate such a plant, since total costs are very sensitive to the costs of energy
- Compare projected unit costs with alternative projects
- Pursue a multi-component financing program, including pursuit of outside funding
- Develop a revenue program that is compatible with other programs (Metropolitan Integrated Resources Plan (IRP), MWDOC Water Reliability Program, OCWD Long-Term Facilities Plan, grant opportunities)
- Determine implementation steps
- Respond to stakeholder concerns

SYSTEM INTEGRATION REQUIREMENTS

The physical facilities for the OWDP will consist of three major components:

1. Seawater intake and return facilities;
2. Membrane Water Treatment Plant (WTP) including pre-treatment, desalination units and post-treatment;
3. System integration facilities to connect the WTP product water with agency transmission and distribution facilities.

Integration facilities necessary to convey OWDP product water to OCWD producers under the base operating condition were covered in the previous PRC work, but studies focused on conveying water to the areas near the imported water connections east of the plant site. However, additional work needs to be undertaken to define the major pumping and transmission facilities necessary to “back feed” to the north 50 mgd from the OWDP site to the area of wellfields in HB, NB, MCWD, and FV. The current groundwater and imported water sources for these producers are typically located at the northern portion of their service areas, and transmission and distribution pipelines typically get smaller toward the coast.

A reconnaissance study by OCWD staff has identified the capacity, location and cost of these integration facilities, which are shown on Figure 5. Capital costs for these facilities approach \$50 million, as shown on Table C-1. (Appendix C) A significant

pumping lift is also required. These costs are based on recent construction bids for similar-size facilities on the GWR System. The unit cost of North Orange County system integration plus energy is about \$80/af.

CUSTOMER NEEDS

Representatives of Huntington Beach, NB, MCWD and FV have been contacted regarding particular needs or issues they might have regarding the OWDP. Preliminary feedback indicates the following:

- Clarification of OCWD's intended purpose in pursuing the OWDP;
- Concern about lost "rights" from reduced coastal pumping;
- System integration details;
- Joint planning for a storage reservoir on AES site (Huntington Beach has recently purchased land for an onsite 10 million gallon reservoir);
- Match the reliability of existing supplies;
- Financial benefit to the basin (pumping relief);
- Protection of supply commitments following water transfer to SOC for an emergency;
- Compatibility with the GWR System;
- Financial match with existing supplies;
- Physical integrity of the OC-44 transmission main;
- Product water quality (taste) variations from current supplies

BENEFITS TO THE CITY OF HUNTINGTON BEACH

Locating the OWDP in the City of Huntington Beach could provide direct benefits to the City. They include:

- The City currently has two primary sources of water, groundwater and imported water. The OWDP would diversify the City's water supply sources providing significantly better water reliability;
- The OWDP would provide new options for the water department in managing its daily operations which could lead to more efficient operations;
- Having a source of water located in the City could insure the residents, businesses and fire department that adequate water supplies will be available especially during emergency and drought events;
- Seawater intrusion is a threat to the City's groundwater wells. The OWDP would assist the District in implementing programs to refill the groundwater basin and to reduce groundwater pumping along the coast when necessary to prevent seawater intrusion;
- The construction of the OWDP may allow the City to eliminate the need to construct local infrastructure improvements; however, this has not been documented;
- The facility itself could be an attraction as it would be one of the largest seawater desalination plants in the Country. By providing a visitor center and conference type facilities; groups from around the world would be encouraged to visit and tour the plant;
- The construction of the OWDP would provide temporary construction jobs and its operation would provide permanent full time jobs.

RECONNAISSANCE WATER COSTS

Reconnaissance costs for ocean water desalination projects have been predicted by various sources:

SOURCE	UNIT COST (\$/AF)
• MWDOC / Poseidon Program – January 2001	788 (a)
• MWDOC Study – SOC	1000 – 1100 (b)
• Ondeo / Degremont Industry Survey	1050 (c)
• Tampa Bay Seawater Desalter	815 (d)
• Shea Construction Company Estimate	600 – 700 (e)

(a) Excludes system integration costs; amortization based on inflation; initial year of operation
 (b) Includes integration; power at 6.2c/kWh
 (c) Average of several operating plants; presented at WBMWD / NWRI / USDC Workshop – August 2003
 (d) Feedwater salinities and power rates are lower than expected for the Huntington Beach OWDP
 (e) Excludes integration; assumes private company operations and year 2010 costs

Power rates have a significant impact on OWDP's. The Tampa OWDP power costs are 4.5¢/kWh. Currently OCWD's average power cost is between 10 and 11¢/kWh.

A summary of OWDP costs is presented in Table 2, including the membrane WTP, and integration. As shown, the total unit cost is \$1130/af. This cost would be a total of \$609/af, if the average costs reported by one interested party, Shea Construction Company, are used. If the OWDP were fully funded by the Metropolitan Local Resources Program (LRP), a rebate of up to \$250/af would reduce net project costs to a range of \$359-\$880/af.

Table 2
SUMMARY OF RECONNAISSANCE – LEVEL DESALINATION PROJECT COSTS

Component	Capital Cost (\$M) ^(a)	O&M Costs (\$M/yr)	2003 Unit Cost (\$/AF)	
			Private Approach	Conventional Approach
Membrane Water Treatment Plant –50 mgd	250 ^(b)	31 ^(c)	529 ^(d)	1050 ^(e)
Integration	46 ^(f)	1.5	80	80
Total	296	32.5	609	1130
Net Range ^(k)			359	880

(a) Includes design, construction contingencies, contractor overhead and profit

(b) Based on \$5M/mgd

(c) Based on industry average of \$1.90/1000 gallons (\$620/af)

(d) Based on average of costs reported by Shea Construction Company; \$650/af (year 2010)

(e) Average of constructed / operated projects

(f) See Appendix C for breakdown

A privately funded and operated facility would have more opportunities to creatively structure the project's financing. It is also possible the plant could be operated at less cost than the public sector. If these competitive advantages would actually lower the cost of the OWDP is unknown. There are also two major additional factors that need to be considered before any assessment could be completed on the low initial \$609/af unit cost which are:

- What type of escalation factors/methodology would be used to annually increase the unit cost of the water? and,
- How does the risk of constructing and operating a plant of this size get distributed between the private company and the public agencies purchasing the water?

Assuming the OWDP \$609/af unit cost could be achieved, a number of positive financial impacts need to be considered including:

1. The Metropolitan \$250/af rebate could lower the unit cost to \$359/af as previously shown, which would make this new source of water located in

- Orange County very economical and attractive. This assumes the entire 50,000 afy receives the Metropolitan rebate;
2. The project could potentially assist the area in avoiding some amount of Metropolitan Tier II cost which is \$89/af higher than Tier I. The amount of possible Tier II water cost avoided is unknown, may not be significant, and will depend upon a variety of factors including growth, hydrology, increased SAR flows, the development of new local projects and other factors. Preliminary estimates indicate the amount of avoided Tier II purchases would be low due to recently refined MWDOC demand estimates which are lower than previous estimates, projected increases in SAR flows, and the development of the GWR System.
 3. As previously discussed, the OWDP in conjunction with the CPTP could significantly increase water levels along the coast effectively preventing any seawater intrusion. Future possible investments in seawater intrusion facilities in the tens of millions of dollars could potentially be avoided. However, these same potential avoided costs could be achieved utilizing Metropolitan water versus constructing the OWDP.
 4. With the implementation of an in-lieu program, the coastal producers would pay the District \$199/af (RA + energy) for OWDP water they receive. This revenue would assist in funding the OWDP. The \$359/af OWDP unit cost (after metropolitan rebate) could be reduced to \$160/af; or as also previously discussed the \$275/af revenue generated by the CPTP could be allocated to the OWDP to lower its unit cost. If the CPTP could be expanded from its current 20,000 afy program up to a 50,000 afy program, the \$359/af OWDP unit cost (after Metropolitan rebate) could be further reduced to \$84/af. However, the RA would correspondingly need to be increased to generate funding to pay the coastal producers who are pumping below the 66 percent BPP in the CPTP or to fund the in-lieu purchases.

REVENUE PROGRAM

The groundwater basin and OCWD customers would benefit from the OWDP operation. The OCWD RA would have to be increased to provide revenues to recover the costs of the base mode of operation. An overall revenue program is not included in this Concept Paper as additional investigation is necessary. The total annual cost of the 50,000 afy OWDP is approximately \$31 to \$57 million depending upon which cost estimate is utilized. These figures include debt service along with operation and maintenance cost. Avoided cost and/or subsidies the project could attract include:

- Receipt of a \$250/af Metropolitan subsidy for the entire 50,000 afy project. The annual subsidy would be \$12.5 million.
- Avoiding the cost of purchasing 50,000 afy of Metropolitan water at an estimated cost of \$460/af. The annual savings would be \$23.0 million.
- Possible \$200/af subsidy received from a potential federal program initiated by the US Desalination Coalition. The annual subsidy would be \$10.0 million for 10 years.

Utilizing the higher \$57 million cost estimate, the total annual net cost of the OWDP could be reduced to approximately \$12 million. Spreading this net cost over the current water demands for OCWD (483,000 afy) would add an additional \$25/af to the cost of all water.

APPENDICES

APPENDIX A

HYPOTHETICAL SUPPLY MIX

Table A-1
HYPOTHETICAL SUPPLY MIX AFTER SEAWATER DESALINATION PROJECT
IMPLEMENTATION – BASE SCENARIO

Producer	Annual Production (Ac-Ft/yr)		
	Seawater Desalination	Groundwater ^(b)	Total
<i>Summer Conditions</i>			
Huntington Beach	22,000	1,300	23,300
(MCWD	10,000	600	10,600
Newport Beach	11,500	700	12,200
Fountain Valley	6,500	400	6,900
Total Summer	50,000 ^(a)	3,000	53,000 ^(c)
<i>Winter Conditions</i>			
Huntington Beach	12,000	1,300	13,300
MCWD	6,000	600	6,600
Newport Beach	6,000	700	6,700
Fountain Valley	4,000	400	4,400
Seal Beach	1,000	200	1,200
Westminster	5,000	600	5,600
Garden Grove	8,500	800	9,300
IRWD	7,500	700	8,200
Total Winter	50,000 ^(a)	5,300	55,300

(a) 50 mgd plant operating at 90 percent Plant Utilization factor (PUF)

(b) Minimum production to maintain viable well operations

(c) Matches Producer / MWDOC groundwater projections for FY 2003-04 at 66 percent BPP (March 2003)

APPENDIX B

CALIFORNIA COASTAL COMMISSION REPORT EXECUTIVE SUMMARY

DRAFT

**Seawater Desalination
And the California Coastal Act**

**California Coastal Commission
August 2003**



DRAFT SEAWATER DESALINATION REPORT
- AUGUST 2003 -

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Members of the State Desalination Task Force
Members of the Coastal Commission staff

DRAFT SEAWATER DESALINATION REPORT
- AUGUST 2003 -

EXECUTIVE SUMMARY

There is growing interest and concern about seawater desalination along the California coast. The interest is due in part to recent technological developments that reduce the costs and energy requirements of producing desalinated water. Additionally, many water agencies and purveyors are interested in reducing their dependence on imported water supplies, and view desalination as providing a reliable and local source of water. The concerns are due primarily to the potential for desalination to create growth and adverse effects beyond the capacity of California's coastal resources.

There are currently about two dozen desalination facilities being proposed along the California coast, including some that would be the largest in the U.S. The state does not have a great deal of recent experience or expertise in evaluating the environmental impacts or the public resource issues associated with desalination proposals, and this report is meant to provide a part of the information needed to carry out those evaluations.

This report has several main purposes.

- To provide general information about the issues related to desalination along the California coast;
- To discuss Coastal Act policies that are likely to apply to various proposed desalination facilities;
- To identify information that is likely to be required during coastal development permit review for proposed facilities; and
- To identify the current status of desalination along with the anticipated facilities now being planned.

Additionally, the report is based on several key points:

- ***It is meant to be informational only:*** The report does not create new regulations or guidelines for reviewing proposed desalination facilities. Rather, it describes desalination issues as they relate to existing Coastal Act policies, and discusses how these policies are likely to apply to a proposal. Additionally, it provides several examples of previous Coastal Commission decisions that illustrate how particular policies may apply to desalination facilities.
- ***It is based on the need to provide case-by-case review:*** Because each proposed desalination facility will have unique design and siting characteristics, Coastal Act policies will likely apply differently to each particular proposal. This report, therefore, makes no overarching recommendations in support or opposition to desalination. Some desalination proposals may be environmentally benign or may even provide environmental benefits; others may cause significant adverse impacts.

DRAFT SEAWATER DESALINATION REPORT
-AUGUST 2003-

Since many of the concerns and issues involved in large-scale coastal desalination have not yet been tested in California, much of this report is written in a precautionary tone. Some of the facilities being proposed raise significant public policy and environmental issues, and the consequences of some issues, especially those related to the private consumptive use of ocean water and international trade agreements, are still emerging. It is therefore likely that the reviews of the first set of upcoming proposed facilities will require comprehensive, detailed, and specific analysis to ensure the facilities meet applicable policies and allow the state to maintain and protect its coastal resources.

The report is also being issued as part of a larger effort to determine the implications of desalination to California. Earlier this year, the Department of Water Resources convened a task force, pursuant to AB 2717, to identify the opportunities and constraints for desalination providing part of the state's water supply, and to evaluate whether the state should play a role in supporting desalination. The [mal version of this report will consider the work of the task force, as well as public comments received over the next sixty days, in more fully evaluating the Coastal Act policies and related issues as they apply to seawater desalination.

INITIAL FINDINGS

Among the primary findings in this report are:

- ***Coastal Act policies do not suggest overall support of, or opposition to, desalination:*** The Coastal Act allows many types of development to occur within the coastal zone, as long as it conforms to Coastal Act policies. Desalination is one of these types of development.
- ***Each proposed desalination facility will require case-by-case review:*** Because each facility has unique design, siting, and operating characteristics, different Coastal Act policies are likely to apply to each one, requiring them to be assessed case-by-case.
- ***There will likely be significant differences in applying Coastal Act policies to public or private desalination facilities:*** The Coastal Act is based on the coastal resources of California being public resources, and the consumptive use of seawater by private interests will require thorough evaluation and adequate assurances that public uses and values will be protected
- ***The most significant direct adverse environmental impact of seawater desalination is likely to be on marine organisms:*** This impact is due primarily to entrainment and brine discharges; however, both can be mitigated through proper facility design, siting, am operations.

APPENDIX C

NORTH COUNTY INTEGRATION COSTS

Table C-1
COASTAL NORTH COUNTY INTEGRATION FACILITIES

FACILITY		COST (\$ M)
A TRANSMISSION SYSTEM ^(A)		
11,000 lf – 48" (Newland)	@ \$575/lf	6.3
11,000 lf – 48" (Adams)	@ \$575/lf	6.3
8,000 lf – 18" (Harbor)	@ \$215/lf	1.7
16,000 lf – 36" (Newland)	@ \$430/lf	6.9
15,000 lf – 16" (Warner)	@ \$190/lf	2.8
13,000 lf – 30" (Warner)	@ \$360/lf	4.7
8,000 lf – 18" (Springdale)	@ \$215/lf	1.7
Subtotal (15.5 miles)		30.4
B Pumping plants		
Booster Station A (WTP)	77 cfs @ 250 psi	2.3
Booster Station B (Newland/Warner)	44 cfs @ 275 psi	1.7
Subtotal		4.0
TOTAL – Construction (2003 levels)		\$34.4
Engineering & Construction Contingencies (35%) ^(c)		12.0
GRAND TOTAL – Capital Cost		\$46.4 ^(b)

(a) Unit costs based on recent construction bids for similar-sized facilities on the GWR System.

(b) Unit cost of amortization and energy is estimated at \$80/af.

(c) Industry rates for reconnaissance - level estimating

APPENDIX D

OWDP REPORTED ECONOMICS

OWDP Reported Economics

Reported	Integration	Total
\$529/af Unit Cost +	\$80/af Unit Cost	= \$609/af Unit Cost
• Assumes: Private financing and operation:		- \$250/af MWD Rebate
• Escalation methodology and Risk sharing unknown		= \$359/af Net Unit Cost
		- \$89/af Max Avoided MWD Tier II Cost ?????
		= \$359/af Unit Cost

OCWD Programs using OWDP Supply – Coastal Wells Turned off

In-lieu Stores water in basin	or	CPTP Transfers Pumping Inland
Producer Pays OCWD \$199/af and receives OWDP water		Inland over pumpers pay \$275/af BEA to OCWD
Net unit cost of OWDP = \$160/af		Net unit cost of OWDP = \$84/af
Requires RA Increase		Requires RA Increase